

Section 5

Observations for Going Forward

5.1 Correlation with LTCP Recommended Plan

The 2015 flow metering data, in addition to the 2013-2014 data, confirmed that the majority of combined sewer overflows in the City occur through the Cemetery Brook overflow (~70%). The modeled CSO statistics presented in the March 2010 Revised Long-Term CSO Control Plan (LTCP) showed the same high percent of overflows through the Cemetery Brook overflow. Further, the Cemetery Brook overflow yielded the most activations (41), with Bridge Street second most active (34) followed by Stark Brook, third most active (30) and Pennacook fourth most active (25) for 2015. The frequent activations at these CSO locations are consistent with monitoring from prior years.

The 2015 flow metering program supports the recommended plan from the March 2010 LTCP. The major part of the recommended plan from the LTCP was a \$65M investment for removal of Cemetery Brook and \$73M investment towards sewer separation of all the contributing catchment areas to the Cemetery Brook Interceptor. The recommended plan will reduce CSO volumes by about 70%, improve water quality in the Merrimack River, reduce street flooding and sewer backups, and provide environmental benefit.

5.2 Comparison of Meter Data and LTCP Model Results

In the interest of furthering the pursuit of CSO control in the City as well as validating past planning efforts, specifically the March 2010 Revised Long-Term CSO Control Plan (LTCP), the existing model was run using the recently collected 2015 rain data to compare metered and modeled overflow activations and volumes. To ensure the spatial variation of rainfall events, the 15-minute rain data from each of the three installed gauges was spatially assigned to the most appropriate CSO basin while dry weather flow and infiltration rate assumptions were consistent with the recent modeling efforts completed as part of the March 2010 LTCP.

Table 5-1 includes a summary of the 2015 continuous monitoring data as well as the results of the SWMM simulations which utilized the 2015 rainfall data.

NPDES #	Name	2015 Metered		2015 SWMM Simulation	
		Activations	Volume (MG)	Activations	Volume (MG)
CSO 011	Schiller St.	none	0.00	none	0.00
CSO 018	Ferry St.	none	0.00	none	0.00
CSO 031	Stark Brook	30.00	8.95	29.00	4.90
CSO 039	Third St.	1.00	0.00	none	0.00
CSO 043	Tannery Brook	none	0.00	none	0.00
CSO 044	Cemetery Brook	41.00	120.87	37.00	124.50
CSO 045	Granite St.	13.00	0.25	1.00	0.30
CSO 046	Bridge St.	34.00	7.48	4.00	15.10
CSO 047	Pennacook St.	25.00	2.98	29.00	6.90
CSO 050	MH1	15.00	12.57	3.00	0.40
CSO 051	West Side Pump Station	none	0.00	none	0.00
CSO 052	MH2	15.00	7.84	2.00	0.40
CSO 053	West Pennacook St.	none	0.00	none	0.00
CSO 054	Ray Brook	6.00	0.10	15.00	0.80
CSO 055	Dunbar St.	3.00	0.14	1.00	0.04
2015 Total		161.18		153.34	

Table 5-1
Comparison of 2015 Meter and SWMM Model Simulation

A few notable observations when comparing the data include the following:

- The annualized total overflow volume resulting from the model simulations was within 5% percent of the actual metered total. This deviation is smaller than the previous two years (2013 - 7%, 2014 - 28%).
- The model matched the observation that five CSOs did not experience any activations in 2015: Schiller St., Ferry St., Tannery Brook, West Side Pump Station, and West Pennacook. Further, the Third St CSO location had only one minor activation (~2,300 gallons), where the model predicted none;
- The model matched well the outfalls at Cemetery Brook (3% deviation) and Granite Street (18% deviation) but measured over half the modeled total at Bridge Street. However, it should be noted that these two CSO basins (Granite Street and Bridge Street) contain significant interconnections with the Cemetery Brook CSO basin and the total overflow volume metered (129 MG) and predicted by the SWMM model (140 MG) were approximately 8% from each other for this Cemetery Brook/Granite Street/Bridge Street basin;
- The two CSOs with the lowest connection to the model were Manhole #1 and Manhole #2, where they under predicted the volume by approximately 19 MG. The reason for the larger deviation was the historical baseline sewer flow was used when running the simulation instead of actual 2015 hourly WWTP flows. The hourly WWTP flows were not available, only daily average flow were available. The historical baseline sewer flow provides diurnal flow and the impacts of snowmelt/infiltration, but doesn't directly represent 2015 conditions. Further, the operation of the flow into the WWTP may have been different in 2015, than the operation rule

in the SWMM model. Manhole #1 and Manhole #2 are impacted directly by the plant operation and water levels in the interceptor because they are the closest to the WWTP.

5.3 Future Flow Monitoring

The City's recommended 20-year plan as outlined in the March 2010 LTCP represents a major financial (\$165M) and environmental commitment. The City completed the required flow metering program for 2013 and has taken an additional step to further verify CSO overflow volumes and activations by completing the flow monitoring program for 2014 and 2015. The City has removed all CSO flow meters and will use the three years of data to recalibrate the SWMM model. Hourly flows from the WWTP will be used to more accurately simulate overflows at Manholes #1 and #2. The recalibrated SWMM model will be used to report CSO volumes for the annual EPA reporting in accordance with the City's NPDES permit. The CSO flow metering program will be re-evaluated again prior to 2018 based on Phase II CSO construction progress and any new regulatory requirements.

5.4 Other Beneficial Projects

The City completed the aeration upgrades at the Wastewater Treatment Plant (WWTP) in December 2015 and have increased flow capacity from 65 mgd to 83 mgd at the plant. The plant upgrades will allow greater wet weather treatment capacity and help lower CSO volumes and reduce wet weather bypassing. The City has started a new WWTP project, a primary clarifier and gravity thickener upgrade. This project is under design and is expected to be constructed by the end of 2017. Both of these projects are part of the improvements at the WWTP included in the March 2010 LTCP recommended plan.

The City is also nearing completion of the \$18M, two phased sewer separation project in the Chestnut Street Area. The first construction contract separating the lower basin has been completed. The second construction contract began in 2014 and will be completed in 2016. This project was included in the March 2010 LTCP recommended plan and provides immediate local flooding and sewer backup relief for area residents, the City's largest Fire Station and several other key stakeholders. The City is also constructing sewer system improvements under Phase II of their CMOM program. These three sewer projects further help separate the City's combined system.

The City will move forward with some system changes based on the results of the monitoring data. The three year flow monitoring data revealed three CSO locations with no activations and three CSO locations with very low activations and volumes represent less than 1% of the total annual CSO discharges. The City will permanently close the two CSO outfalls with no activations (#051 – West Side PS, #053 – West Pennacook Street) within six months. For the third CSO, it should be noted that although Tannery Brook CSO 43 did not overflow throughout the last three years of metering (2013-2105), and the metering results suggest a level of control greater than a 5-year storm, it remains the sole hydraulic relief point for this catchment area with combined sewers. As such, we recommended to keep this CSO as “inactive” and retain in the permit as an extreme event overflow hydraulic relief point. The City will investigate raising the overflow weir approximately 6-inches to elevation 151.76 and then visually inspect following future significant storms to confirm system performance.

Also, the City will perform a brief study on the other three CSO locations with very low activations (#011 – Schiller Street, #018 – Turner Street, #031B – Eve Street) and will evaluate closing them permanently, with a goal of closing those within one year.